



U.S. DEPARTMENT OF ENERGY
NATIONAL NUCLEAR SECURITY ADMINISTRATION
OFFICE OF DEFENSE NUCLEAR NONPROLIFERATION

Office of Defense Nuclear Nonproliferation

NNSA's Support to U.S. Advanced Reactor Industry - International Safeguards and Security

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An organization that is innovative, adaptive, and anticipatory as it responds to current and evolving global nuclear risks.



NNSA'S SUPPORT FOR THE U.S. ADVANCED REACTOR INDUSTRY

- **NNSA's Support for the U.S. Advanced Reactor Industry**
- **International Safeguards**
- **International Security**
- **How can industry work with NNSA?**



NNSA'S SUPPORT FOR THE U.S. ADVANCED REACTOR INDUSTRY

- **FY21 Omnibus Appropriations Act directs NNSA to:**
 - ✓ Evaluate the nonproliferation, security, and safeguards aspects of advanced reactors
 - ✓ Support DOE NE's development of safeguards concepts, policies, and technologies to address the proliferation challenges
 - ✓ To work with the NRC and the national labs to ensure the implementation of “safeguards-by-design” features in advanced nuclear reactors

- **Office of Nonproliferation and Arms Control**
 - ✓ International Nuclear Safeguards
 - ✓ 10 CFR Part 810 (Part 810) Nuclear Export Controls
- **Office of International Nuclear Security (INS)**
 - ✓ Civil Nuclear Security Program (CNSP)

OFFICE OF
**NONPROLIFERATION AND
ARMS CONTROL (NPAC)**





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International Safeguards

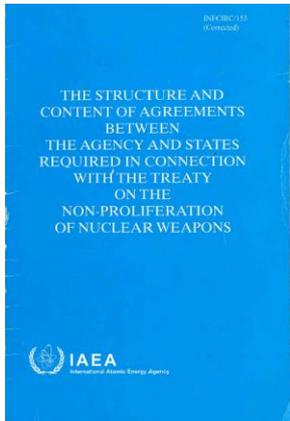


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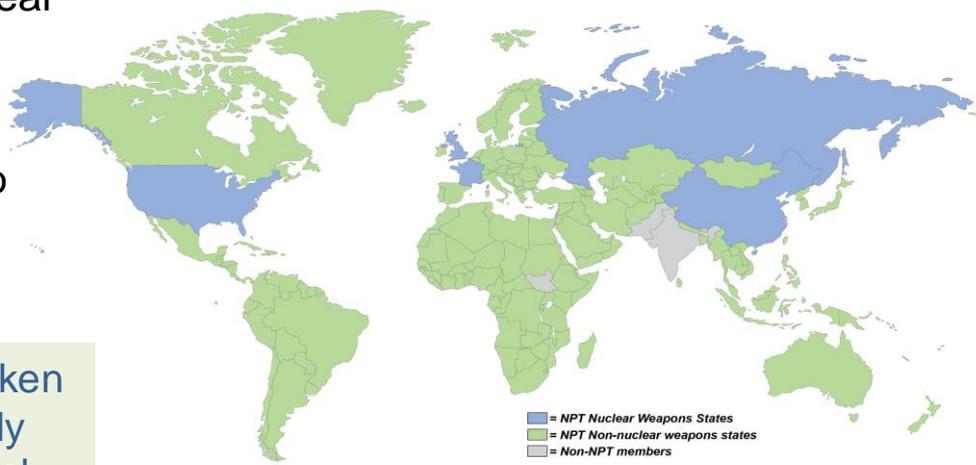


IAEA SAFEGUARDS

- Purpose: To allow the IAEA to verify that nuclear materials & technologies are used only for peaceful purposes
- Apply to nuclear activities *within a State's territory, under its jurisdiction or carried out under its control anywhere*
- All parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) **agree to require international safeguards be applied** to nuclear material and equipment transferred to a non-nuclear weapon State (NNWS)
 - ✓ Each NNWS party to the NPT is required to conclude a Comprehensive Safeguards Agreement (CSA) with the IAEA



Comprehensive Safeguards Agreement (INFCIRC/153)

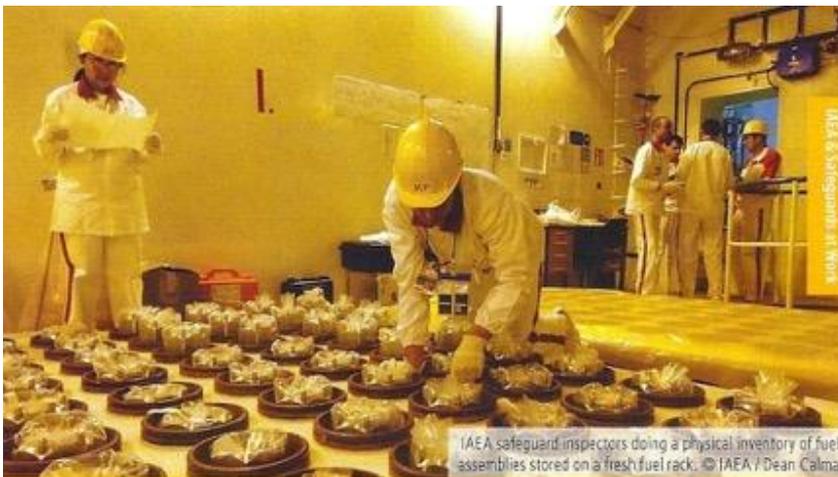


IAEA safeguards is a **treaty requirement** undertaken by States that enables the IAEA to independently verify that a **State** is not diverting nuclear material from declared activities.



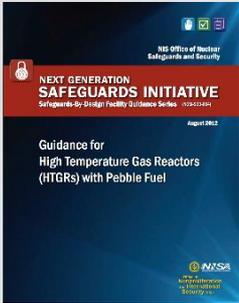
- Any reactor, fuel, or major critical components exported to a NNWS will be under IAEA safeguards consistent with U.S. export control laws and regulations, as well as the recipient countries' NPT obligations
- NRC licensing requirements may not reflect all the aspects necessary for effective implementation of IAEA safeguards
- Reactors and associated fuel cycle facilities may be subject to IAEA safeguards in the U.S.

“Suppliers should transfer trigger list items or related technology to a non-nuclear weapon State only when the receiving State has brought into force an agreement with the IAEA requiring the application of safeguards on all source and special fissionable material in its current and future peaceful activities”
– Nuclear Suppliers Group Guidelines

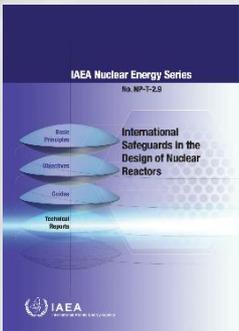




HOW CAN VENDORS PREPARE FOR IAEA SAFEGUARDS?



[NNSA SBD Reference Documents](#)



[IAEA SBD Guidance](#)

- **Safeguards by design (SBD) can help to mitigate the possibility of design changes necessary to accommodate international safeguards**
 - ✓ Current safeguards approaches were developed for large LWRs and may not be directly applicable to advanced reactor designs
 - ✓ May be necessary to develop new safeguards approaches
- **Best addressed via early consideration of safeguards in the design process - SBD**
 - ✓ A dialogue where international safeguards considerations are fully integrated into the design, construction, operation, and decommissioning of a nuclear facility
 - ✓ Reactor vendors & designers in all phases (concept to deployment) should consider SBD
 - ✓ SBD is a voluntary collaboration from U.S. Industry that precedes the legal requirement for provision of design information

Program Objective: Partner with and support U.S. vendors to ensure international safeguards are fully integrated into the design process of a new nuclear facility by providing expert SBD assessments

Adopting SBD can place U.S. vendors in a more favorable position internationally!



STEPS NNSA IS TAKING: INTERNATIONAL SAFEGUARDS

NNSA can partner with U.S. advanced reactor designers and other stakeholders to provide expert support in promoting the timely incorporation of SBD through policy and technical initiatives.



Focus Areas and Activities

Technical and Policy Analysis

- ✓ Survey of potential **international safeguards challenges** posed by advanced reactor concepts
- ✓ Technical **gap analyses** to identify safeguards approaches for various advanced reactors
- ✓ **Crosswalk** of domestic and international safeguards regulations for industry

SBD & Industry Engagement

- ✓ Provide **expert SBD assessments** to U.S. vendors via no-cost partnerships
- ✓ **Map opportunities** & barriers for industry SBD implementation
- ✓ **Support the IAEA** in SBD implementation
- ✓ Collect and disseminate **lessons learned**

Develop Solutions

- ✓ Develop solutions to safeguardability challenges
 - Identify and **evaluate safeguards concepts**
 - Develop **design-specific safeguards approaches**



Benefits to U.S. Industry

- ✓ Vendors **avoid potential costly retrofits** and redesigns down the road
- ✓ **Better position U.S. vendors** in global market
- ✓ **Reduced risk** to scope, schedule, budget, and licensing
- ✓ **Access** to world-class technical experts at national laboratories
- ✓ Better **understanding** of export control and safeguards legal requirements
- ✓ Forge early and collaborative **relationship with the IAEA**



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International Security



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Our Mission

Lead U.S. international efforts to prevent theft and sabotage of nuclear materials and facilities worldwide.

INS Civil Nuclear Security Project

Building relationships with U.S. nuclear energy industry vendors & embarking countries on nuclear security topics to support:

- Restoring U.S. leadership in nuclear
- Advancing peaceful uses
- Upholding the global nuclear security regime

IAEA Milestones Approach to Nuclear Infrastructure for Nuclear Power (IAEA Nuclear Energy Series NG-G-3.1 Rev.1)



Tools Under Development

- Economic costs and benefits of security
- Identifying sabotage target sets for advanced reactors
- Physical Protection Systems Design Training- Design Evaluation Process Outline (DEPO) Methodology Videos
<https://nstc.sandia.gov/training/smr-depo-course>

Standard Nuclear Security Tools

Tool Examples:

- SCRIBE 3D (tabletop exercises)
- PATHTRACE (pathway analysis)
- JCATS (combat simulation instrument)



HOW CAN INDUSTRY WORK WITH NNSA ON SECURITY AND SAFEGUARDS BY DESIGN FOR INTERNATIONAL DEPLOYMENT?

Upcoming Opportunities for Joint Discussion:

- ✓ **Outreach:** Webinars, RFI's (from NNSA to industry), NEXUS, ARDP, Stakeholder Meetings via GAIN, Industry Associations/NGO's
- ✓ **Technical Support:** NNSA-funded activities at DOE Labs to support overall industry needs in safeguards and security (ongoing)

To develop a partnership with industry, the DOE National Labs can enter:

- ✓ **Nondisclosure Agreements (NDAs)** are available to have detailed discussions of technologies that can include proprietary information
- ✓ **Cooperative Research and Development Agreements (CRADAs)** are available to expand a company's proprietary capabilities or knowledge-set



International Nuclear Safeguards

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